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SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-AB-2001-220**  
Ender Savrun & Eckart Schmidt (Sienna), Adam Brand (PRSP), "Novel Catalysts for Non-Toxic  
Monopropellants" (Abstract only)

**AIAA Joint Propulsion Conference**  
**(07-10 July 2002)      (Deadline: 06 November 2001)**

**(Statement A)**

## **NOVEL CATALYSTS FOR NON-TOXIC MONOPROPELLANTS \***

Ender Savrun and Eckart Schmidt, Sienna Technologies, Inc., Woodinville, WA  
Adam Brand, AFRL, Edwards AFB, CA

Reduced toxicity ionic salt monopropellants containing hydroxylammonium nitrate ( $\text{HAN}, [\text{HO-NH}_3^+]\text{NO}_3^-$ ) in highly concentrated aqueous solutions have been proposed as replacements for hydrazine. To be competitive with the rocket performance of hydrazine, HAN-based monopropellants will have to operate at temperatures above the limit of the state-of-the-art catalyst Shell 405 ( $1371^\circ\text{C}$ ). To realize the benefits of reduced toxicity propellants without a concomitant loss of performance, catalysts and chamber materials capable of withstanding operating temperatures above  $1371^\circ\text{C}$  have to be developed.

Sienna Technologies, Inc., has successfully demonstrated the feasibility of a family of ceramic based catalysts that can decompose nontoxic HAN-based liquid monopropellants, and withstand the high temperature, acidic and steam-rich environment encountered during thruster operations. Several processing techniques were developed to manufacture these carriers and potential catalysts in granular forms which result in reproducible packing densities in packed bed reactors. Rocket engine tests demonstrated that STI- developed catalysts are more active and more durable than any other catalysts tested to date with the hot AFRL-developed ionic salt monopropellants. This presentation summarizes our efforts.

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